

A NEW CRAWFISH OF THE SUBGENUS *GIRARDIELLA*,
GENUS *PROCAMBARUS* FROM NORTHWEST ARKANSAS
(DECAPODA, CAMBARIDAE)

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Abstract.—A new burrowing crawfish of the subgenus *Girardiella* of the genus *Procambarus* is described from Benton County, Arkansas. It is assigned to the Gracilis Group. The new species is distinguished by a linear areola, broad caudal process and other features of the male first pleopod.

Over the course of time, my family has been well trained to be alert for any unusual crawfishes to give to "Daddy." Thus, when the animals described below came to the attention of the children and their mother, they were careful to preserve them. On several occasions since 1964, I had attempted, unsuccessfully, to excavate burrows northwest of Rogers in Benton County, Arkansas, which were markedly similar to those of members of the subgenus *Girardiella* which I had been studying in Mississippi and Alabama—holes without chimneys, or nearly so, leading nearly straight down, and located in high meadows or pastures, removed from nearby watercourses.

In the summer of 1976, the cat of Mr. Harold May of Bentonville brought several crawfishes to him for "reward." When he mentioned this to my family, they determined that the crawfishes had been caught at night when they emerged from their burrows in his backyard, apparently to forage. Such behavior is common in *P. (G.) hagenianus* (Faxon) in Mississippi and Alabama. Subsequent "collections" by the cat were preserved and given to me in the late fall of that year. I discovered that they represented an undescribed species, and Dr. Horton H. Hobbs, Jr., compared them with materials at the National Museum of Natural History to confirm my opinion.

I am indebted to my children, Joseph, Kathleen, Eileen and Daniel; to their mother, Sarah E. Fitzpatrick; and to Mr. May and his cat for collecting the animals for me. I also thank Dr. Hobbs for examining the specimens and reading the manuscript. The Research Committee of the University of South Alabama provided partial support of incident expenses.

Procambarus (Girardiella) liberorum new species

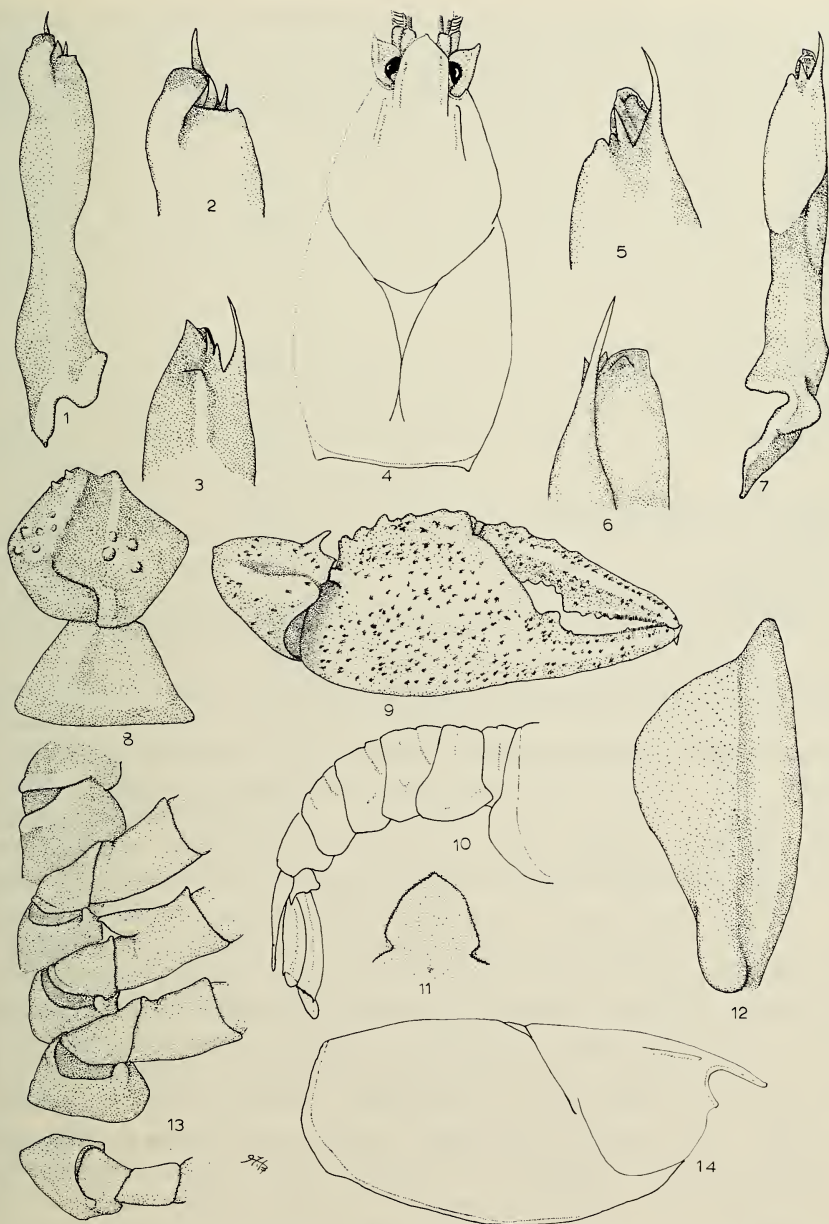
Diagnosis.—Pigmented; eyes small, but well developed. Rostrum with gently converging margins, lacking marginal spines (Fig. 4); acumen nearly obsolete and poorly delineated from rostrum. Areola 39.3-41.5 (av.

40.2)% of entire length of carapace; areola linear. Carapace lacking cervical spines or tubercles. Suborbital angle broadly acute to obsolete. Post-orbital ridges terminating cephalically without spines or tubercles. Cephalic part of epistome (Fig. 11) rounded trapezoid, lacking cephalomedian tubercle. Antennal scale 2.05–2.67 (av. 2.31) times longer than broad, widest distal to midlength, thickened lateral part terminating cephalically in short, stout, subconical spine. Mesial margin of palm with row of 6–7 strong, spinose tubercles decreasing in size distally, 2 additional irregular rows of 5–6 and 3–5 more squamous tubercles medial to it. Dactyl with 2–5 small tubercles on basal fourth of mesial margin. Opposable margin of immovable finger with large tubercle in basal fourth, tiny tubercle in proximal part of gently excavated next half, and distal fourth with crowded minute denticles interrupted by small tubercle proximally. Opposable margin of dactyl deeply excavate in basal third with 3 small tubercles, 2 more tubercles on margin proximal to midlength, and distal half with band of crowded, minute denticles, broken by small tubercle near base. Ischia of third pereopods only bearing hooks in males; no conspicuous prominences or bosses on coxae of pereopods (Fig. 13). Inner ramus of uropod lacking prominent spines projecting beyond distal margin (Fig. 10). First pleopods symmetrical, strong right-angled shoulder at base of central projection, pleopods reaching coxae of third pereopods when abdomen flexed; distal extremity bearing (1) prominent, subacute, nearly setiform mesial process extending subparallel to main axis of pleopod and twice distance distally as other elements, and gently curved cephalad in distal half; (2) well developed central projection terminating distally in acute angle directed slightly caudolaterally; (3) conspicuous, subrectangular (in lateral aspect) caudal process laterally compressed distally, and extending distad just beyond central projection; and (4) prominent cephalic process placed cephalomesial to central projection, extending 90% of length of latter and running subparallel to main axis of pleopod. Annulus ventralis of female deeply excavate in cephalomedian half, flanking ridges ornamented with several prominent spines or tubercles, sinus originating in posteriodextral portion of trough, arching mediocaudad to midposterior margin; postannular sternite subtrapezoidal, excavated in center.

Holotypic male, Form I.—Body subovate, indistinctly compressed. Abdomen narrower than thorax (12.7 and 15.6 mm). Width of carapace at

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Figs. 1–14. *Procambarus (Girardiella) liberorum* (all figures of holotype, unless otherwise noted): 1, Lateral view of first pleopod; 2, Lateral view of terminal elements of first pleopod; 3, Cephalic view of terminal elements of first pleopod; 4, Dorsal view of carapace; 5, Mesial view of terminal elements of first pleopod; 6,



1, Caudal view of terminal elements of first pleopod; 2, Mesial view of first pleopod; 3, Annulus ventralis and fifth sternite of allotype; 4, Upper view of distal podomeres of cheliped; 5, Lateral view of abdomen; 6, Cephalic part of epistome; 7, Upper view of antennal scale; 8, Proximal podomeres of left pereiopods; 9, Lateral view of carapace.

Table 1. Measurements of type-specimens of *Procambarus (Girardiella) liberorum* (in mm).

	Holotype	Allotype
Carapace		
length	37.5	37.5
width	15.6	16.6
height	15.5	16.6
Areola		
length	15.0	15.2
Antennal scale		
length	4.5	5.1
width	2.0	2.1
Rostrum		
length	7.6	8.1
width	5.0	5.5
Chela		
length of inner margin of palm	11.6	9.3
width	14.8	11.3
total length	33.3	25.1
dactyl length	21.7	15.3

caudodorsal margin of cervical groove scarcely less than height (15.6, 15.9 mm). Areola 40.0% of total length of carapace, cephalic section of carapace 1.5 times length of areola. Rostrum depressed (Fig. 14), excavate dorsally, with slightly thickened gently converging margins, marginal spines lacking; acumen nearly tuberculate and poorly delimited; upper surface sparsely punctate, but with usual submarginal row of setiferous punctations. Subrostral ridges well developed to below suborbital angle and visible in dorsal aspect to about midlength of rostrum. Branchiostegal spine obsolete. Carapace punctate dorsally and laterally, grading to granulate cephalolaterally and with prominent squamous tubercles on cephalolateral surfaces. Cephalic section of telson with 2 spines in each caudolateral corner. Cephalic section of epistome as described in "Diagnosis." Antennules of usual form with well developed spine on ventral surface of basal segment slightly distal to midlength. Antennae broken; antennal scale (Fig. 12) 2.25 times longer than broad, widest distal to midlength.

Ischium of third maxilliped with dense, long, stiff setae arising from ventromesial surface and row along ventrolateral margin, setae of latter row shorter.

Right chela (Fig. 9) with palm inflated, moderately depressed; lateral margin entire and not keeled; palmar area covered with setiferous punctations above and below; mesial margin of palm with row of 7 spinose tubercles and irregular rows of 5 and 3 squamous tubercles medial to it.

Both fingers with submedian longitudinal ridge above and below, each flanked by setiferous punctations; mesial margin of movable finger with row of 4 small tubercles decreasing in size distally. Opposable margin of immovable finger with a single large tubercle in basal fourth, gently excavate with tiny tubercle proximodorsally in middle half, and distal fourth with crowded minute denticles, interrupted proximally by small tubercle. Opposable margin of dactyl with basal third deeply excised and bearing 3 small tubercles, 2 more small tubercles in basal half, and distal half with crowded minute denticles interrupted proximally by 2 small tubercles.

Carpus of right cheliped longer than broad; mesial surface with strong acute spine at base of distal third, 3-5 squamous tubercles proximal to it, and small, nearly tuberculiform spine at mesiodistal margin; punctate above and below with deep longitudinal furrow above; distal corners of ventral surface with stout acute spine.

Merus of right cheliped with single acute spine on distodorsal margin and row of 5 tiny tubercles proximal to it in distal half of podomere; ventromesial margin with row of 10 spines increasing in size distally; ventrolateral margin with row of 2 tiny, followed by 1 large, 1 tiny and 1 larger tubercle in distal two-thirds. Ischium without spines or tubercles.

Hooks on ischia of third pereopods only, directed proximally to extend over distal fourth of basis. No bosses or eminences on pereopodal coxae.

First pleopods (Figs. 1, 2, 3, 5, 6 and 7) as described in "Diagnosis"; tips of all elements except mesial process corneous.

Uropods as in "Diagnosis."

Sternites and extreme basal portions of coxae of pereopods with long, dense setae partly concealing pleopods when latter held under thorax.

Male, Form II.—Unknown.

Allotypic female.—Differing from holotype in following respects: acumen more acute, but still quite reduced; mesial row of tubercles on palm flanked above and below by squamous tubercle at level of gap between 2 distalmost tubercles, next most medial row consisting of 6 tubercles. Sternites and pereopodal coxae with only scant, short setae.

Annulus ventralis (Fig. 8) as described in "Diagnosis," with numerous tubercles on elevated (ventrally) cephalolateral parts; sinus arising in right third of annulus near midlength, soon turning sharply sinistrad to median line, then recurving to interrupt midcaudal margin; postannular sternite as described in "Diagnosis."

Types.—USNM 148353 and 148354 (holo- and allotype, respectively). Paratypes: all topoparotypic, all USNM (1 ♂ I, 2 ♀ ♀).

Type-locality.—Bentonville, Benton County, Arkansas; yard at 206 SW Seventh Street.

Range.—Known only from the type-locality, but burrows located northwest of Rogers are probably inhabited by this species.

Variation.—All variations noted in this limited sample are covered in the descriptions and diagnosis sections above.

Relationships.—*Procambarus (Girardiella) liberorum*, because of the presence of the cephalic process on the first pleopod and of uropod morphology, is assigned to the Gracilis Group. Its pleopod is more nearly like that of *P. (G.) gracilis* (Bundy), but it can be distinguished from it by the wider caudal process originating more proximally, by the base of the mesial process being more or less straight, and by the cephalic process being directed less cephalically. It differs from the subspecies of *P. (G.) simulans* in possessing a broader central projection and caudal process and a dactyl which is deeply excised in its basal third; it likewise has a linear, rather than open, areola. The annulus of the female is more like that of *P. (G.) tulaneii* Penn, particularly in the configuration of the postannular sternite. But in *P. (G.) tulaneii* the cephalolateral eminences of the annulus overhang the adjacent sternal plate, and this is not so in *P. (G.) liberorum*. Further, *P. (G.) tulaneii* has what is clearly the broadest areola in the subgenus and is unique in the Gracilis Group in having a bearded hand. *P. (G.) liberorum* is easily separable from *P. (G.) curdi* Reimer (1975) in that the terminal elements, except for the mesial process, of the latter are directed sharply cephalically, and the areola is clearly open.

Full bibliographic citations for most species are available in Hobbs (1974). Citation here would be redundant, and interested parties should consult Hobbs.

Etymology.—From the Latin, *liber*: children; in recognition of my family's efforts in bringing this species to my attention.

Literature Cited

- Hobbs, H. H., Jr. 1974. A checklist of the North and Middle American crayfishes (Decapoda: Astacidae and Cambaridae). Smithsonian Contrib. Zool. 166:iii + 161 pp.
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